

OUR LAND OUR LIFE

**A COURSE OF PRACTICAL
ENVIRONMENTAL STUDIES
FOR CLASSES VI - X IN THE
SCHOOLS AND INTERMEDIATE
COLLEGES OF UTTARANCHAL**

COURSE DESCRIPTION

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Introduction

The National Education Policy of 1986 specifies environmental education (EE) for school curricula throughout the country. It is generally agreed that to be effective such EE should be location specific, that is relevant to the conditions of each ecological zone of the country. This means that the content of EE will vary throughout the country. Urban environmental problems differ from those of rural areas and therefore different subject matter content will be needed for urban and rural students.

This directive has so far been implemented on a national scale by infusing environmental concepts and knowledge into existing courses in school curricula. This has, however, given rise to a uniform treatment of environmental education subject matter for the entire country. Further, the subject matter has a strong urban bias, there is inadequate treatment of the livelihoods dimension of environmental problems, and also inadequate attention to skill development. Contradictions have also unintentionally been introduced, particularly between standard development thinking, a feature of our syllabi and textbooks for the past five decades, and the message of the need for sustainable natural resources use; these need to be removed.

The Department of Education, Ministry of Human Resources Development, Government of India at the same time has encouraged and supported other approaches to EE on an experimental basis. Thus the Uttarakhand Seva Nidhi Paryavaran Shiksha Sansthan (USNPSS), Almora, with Ministry support and in collaboration with the Uttar Pradesh Education Department, launched a separate EE course specific to Uttarakhand (now Uttaranchal) in 1988. The course addresses land degradation (deforestation and soil erosion), the chief environmental problem of the state, as well as the further problems arising out of village land degradation, i.e., water scarcity, falling crop yields, fuelwood and fodder scarcity, drudgery for women and girls and the forced migration of men and boys for employment. The course thus meets the objective of local relevance; it focuses on immediate issues of well-

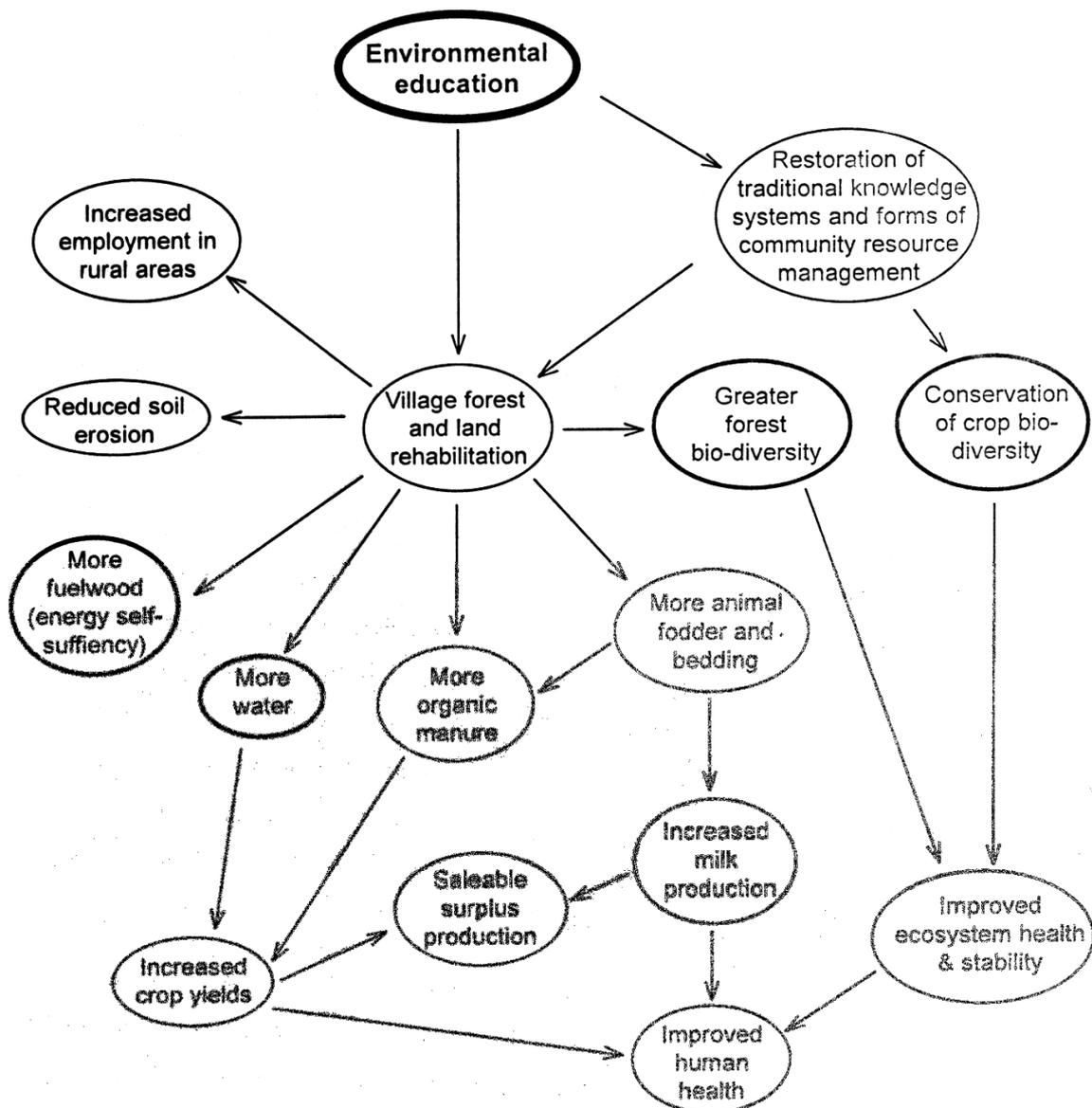


Figure 1. A locally-relevant EE course can be a catalyst to improve village ecosystem health, stability and productivity. This diagram depicts the possibilities in the hill region of Uttaranchal state. A beginning must be made with the restoration of traditional knowledge systems and forms of community resource management, modified/enriched by modern ecological concepts, as well as awareness of gender equality and the need for whole village participation in governance. This scenario is an attempt to formulate in concrete terms a programme of sustainable local development.

being and livelihoods. The local community is involved in the course. Skill development is emphasised through practical work. Whereas the infusion approach seeks to give an environmental orientation to the subject matter of conventional school disciplines, the course approach, as formulated by the USNPSS, draws concepts and knowledge from these disciplines and brings them to bear on the solution of local environmental/livelihood problems. In our opinion both approaches are needed fully to meet the objectives of EE.

Figure 1 depicts the role of EE in the improvement of the local environment and local livelihoods.

This note briefly describes the course and reports the results of an extensive course evaluation completed over the past two years.

Course design

The course seeks to address the concerns of the rural people of Uttaranchal. These have been expressed in the *andolans* of the 1970s and the spontaneous constructive work of village women's groups thereafter.

The course is of 5 years duration, designed for grades 6 to 10. It consists of 63 practical exercises in all. The broad subject-matter themes of these are: land, water, trees, crops, compost, animals, fodder, fuelwood, people and the village ecosystem of which all these are parts. These subject-matter themes are woven upon, so to speak, the year-wise general themes listed in Table 1 to give the basic fabric of the course. Concepts and skills are built up step by step from exercise to exercise and year to year.

The exercises are set forth in 5 workbooks. The objective of each exercise is stated and the methodology to be employed is explained. The month in which each exercise is to be done and the number of periods required for it are specified. Spaces are provided for answering questions, doing calculations, making diagrams, maps and notes. Most exercises are accompanied by one or more 'boxes' which explain the concepts and procedures needed to do the exercise meaningfully. Students generate their

own data for the most part, but some supplementary data are also given in various boxes where needed to make a concept clear or make it possible for them to complete an exercise.

Table 1. General themes covered in each year of the course

Grade	Themes
6	Measurement techniques; introduction to principles of good land management.
7	Soil-plant-water relationships; tree management; support-area (village forest) rehabilitation.
8	Introduction to ecological concepts; crop production.
9	Further development of ecological concepts; planning support-area rehabilitation and water use for study village; human and animal population dynamics.
10	Study-village ecosystem evaluation; community; organisational aspects of village ecosystem management.

The set of 5 workbooks is accompanied by a 'Teachers' Manual'. This sets forth the rationale of the course, its objectives, the concepts to be highlighted each year, and suggestions for carrying out the various exercises. The students' workbooks are thus not cluttered with information needed only by the teacher. (The rationale of the course and its objectives are explained to the students too, but in different language, gradually and at the appropriate time.)

The course is designed to require 5 short periods (40 minutes each) per week and one long period (3 hours) per month. About half the long periods are spent in a nearby 'study village' making measurements and observation, and talking to the residents. (One village is visited by the same batch' of students as they progress from the 6th to the 10 grades. Each batch that enters the 6th grade is assigned a different village.) A few exercises need more than one long period at a stretch. Also, most exercises are season-bound. Therefore some flexibility is needed in the school timetable; that is, the trading of periods among different subjects is occasionally required.

Concepts

The unifying and organising concept of the course is that of the ecosystem. The village is seen as an ecosystem. Subordinate concepts are: species; population; community; energy flow; water balance; nutrient cycling; biodiversity; species adaptation; ecosystem evolution, equilibrium, degradation, and rehabilitation; sustainability; and carrying capacity. All these concepts are presented as tools for improved village natural resource management. For example, biodiversity is seen as essential for high and sustainable ecosystem productivity, and is to be preserved/recreated in cropland and support area. Similarly, locally-adapted species of plants and animals are seen as necessary to sustainable production.

The concept of community as an agent which shapes and manages the village ecosystem is a critical element in the course.

Skills

Village ecosystem rehabilitation and sustainable management require a range of new skills in addition to new concepts. The course seeks to impart these.

1. Methods of data collection and interpretation, including the application of known mathematical concepts and operations to a new area of activity. Data interpretation includes, indeed culminates in, ecosystem analysis. For this an ecosystem model is quantified (land areas, population sizes, productivities).
2. The collection of knowledge of traditional management practices from village residents. The evaluation of this knowledge, as well as of scientific knowledge drawn from other subjects, within the framework of ecological concepts already mentioned.
3. Methods of support-area rehabilitation — walling, gully-plugging, tree plantation and care.
4. Production of tree seedlings.

5. Tree management for fodder, fuelwood and stemwood production.
6. Formulating comprehensive and detailed village support-area rehabilitation plan. Also a village water management plan. Organising and conducting village meetings to discuss and finalise draft plans.
7. The methods of building irrigation tanks, fuel-efficient chulhas, sanitary, composting latrines and feeding mangers. Though the students do not build these as a matter of course, their teacher can take them up as extra-curricular activities.

Table 2. The main topics covered in each year of the course

Grade	Topics
6	Construction of map of study village. Measurement techniques and mathematics involved. Introduction to plant -soil-water relationships. Introduction to the principles of good land management. Growing tree seedlings. The natural vegetation of Uttaranchal. Learning the history of study village and traditional land-and animal-management practices
7	Study village support-area rehabilitation project, including tree seedling production, begins. Geology of Uttaranchal. Soil formation and erosion. Rainwater runoff and infiltration. Measuring spring flow and domestic water consumption. Support-area land classification. Measurement of rainfall and analysis of data.
8.	Support-area rehabilitation project continues. Measuring crop yields, compost application rate, use of animal bedding and consumption of fuelwood. Measuring land area. Concept of slope. Population dynamics. Introduction to ecological concepts. How to build fuel-efficient <i>chulhas</i> and sanitary latrines
9	Support-area rehabilitation project continues. Enumerating human and animal populations of study village. Measuring fodder consumption and wood production. Further ecological concepts. Introduction to national and global environmental problems. Formulation of draft plans for study-village support-area rehabilitation and water-use. How to build a water-storage tank.
10	Support-area rehabilitation project continues. Estimating future productivity of study village and future carrying capacity. Population stabilisation. Discussion and finalisation of draft plans in village meetings.

Course content

The main topics covered in each year of the course are listed in Table 2.

Teaching methods

In the course being described practical work is primary. For this reason small batches of students are recommended; not more than 30 is best.

To facilitate the practical work, teachers are advised to divide the practical batch into 10 teams. The assignment of tasks becomes easier. One student is made the leader, and is responsible to the teacher for the correct and timely completion of the work assigned to the team and for ensuring that all the members of his/her team acquire the concepts and skills being taught. The supervision of 10 teams can be more effective than of, say, 30 individuals. Students learn teamwork.

A discussion mode of teaching is required in this course. Students first discuss their work, and their responses to the many problems and questions in the workbooks, within teams and later in the entire batch. The theory boxes lend themselves to a conventional lecture mode, but otherwise the teacher is a discussion leader.

In this course a specific village is the laboratory. This means that the teacher requires the co-operation, indeed the collaboration, of the residents. They must be made aware of the aims and requirements of the course, just as the students themselves. Some initial spade work is needed. Parents are often skeptical to begin with, questioning what 'education' can possibly be achieved in a village. (For them 'education' is thought of as a preparation for obtaining jobs outside the village.) In the long run the residents stand to benefit enormously from the course in the shape of concrete village plans made by the students (which it is hoped they will feel sufficiently motivated to implement). This must be explained beforehand.

At the end of each academic year schools/colleges are encouraged to organise 'work display days', popularly termed '*paryavaran melas*', where students display/demonstrate what they have learned. There are also competitions, plays and songs. Parents and residents of the surrounding villages are invited. These me/as are seen as an important means of promoting the involvement of the local community in the course.

Operation of the course

In Uttaranchal (formerly a part of Uttar Pradesh) a slot for the course has been found at the middle school level (grades 6, 7 and 8) in the optional list of subjects. Schools/intermediate colleges are selected for the programme by the USNPSS and the District Inspector of Schools on the basis of interest shown in the course by a teacher of the school/college or the principal. (All participating schools/colleges are government or government-aided. Hindi is the medium of instruction.)

A teacher from a selected school/college is given an initial training by the USNPSS. This consists of a general orientation plus specific training for the sixth grade component of the course. The same teacher comes back at the beginning of each subsequent academic year for two further years for training in the 7th and 8th grade components of the course. As the number of grades of the course at a given school/college increases from one to three, a second teacher is also trained. Teacher training courses are of 5 days duration. One-day orientation meetings are held for principals and for Education Department officials and supervisory staff.

Copies of student workbooks and teachers' manuals are supplied free of cost to participating schools/colleges, as well as a set of tools and instruments required for the practical work.

Visits are made by USNPSS staff to participating schools/colleges during the school year to monitor progress-help sort out problems and clear up doubts teachers may have. One or two one-day meetings of teachers with the project

staff are held during the school year to discuss progress and solve problems that have arisen. Examination papers are sent out for half-yearly and annual examinations for each class, and the answer books, after being marked by the teachers themselves, are sent in for evaluation by project staff.

The course has been revised twice, in 1992 and 1996, on the basis of feedback from teachers and the observations of USNPSS staff. A few instances of innovative methods of teaching a particular topic devised by teachers have been incorporated in the course.

In the academic year 2000-2001 approximately 500 schools and intermediate colleges, 65,000 students and 1000 teachers were involved in the course.

Unfortunately, it has not yet been possible to find a slot in the curriculum for the course at the high-school level (grades 9 and 10). This is because of the standardised state- wide and nation-wide high school curricula which at present makes no provision for a separate EE course. At present, therefore, students' training is incomplete.

Evaluation

Course evaluation

During the academic year 1999-2000 routine visits by our staff were made to 208 schools and intermediate colleges out of a total of 434 in the programme. A formal assessment of the performance of these schools/colleges was undertaken on these visits in accordance with a prepared evaluation format. Schools were assigned grades according to the definitions given in Table 3.

Table 3. Definitions of grades assigned to schools on the basis of overall performance

Grade	Definition
A	The course has been taught on the basis of the methodology suggested in the workbooks and 'Teachers' Manual', practical work has been done completely and satisfactorily, children are aware of local environmental issues, knowledgeable and have mastered the required skills.
B	All specified work has been done, but the quality of teaching and learning could be improved.
C	Specified work mostly done, quality of teaching and learning average.
D	Amount and quality of work done and learning outcomes unsatisfactory.
E	Nothing much happening.

Out of the 208 schools visited, complete evaluation was possible for 183. The distribution of grades assigned is presented in Table 4.

Table 4. Distribution of grades assigned to schools on the basis of performance

Grade	Number of schools	% of total
A	10	5.5
B	57	31
C	77	42
D	29	16
E	10	5.5
Total	183	100

The good performance of some schools (A grade) suggests that the academic standard we set in the course, the quantity of work prescribed, and the teaching methods suggested are achievable in practice. With respect to

academic standards, we have maintained those standards set in the other courses in the curriculum. That many schools/colleges rated poorly (i.e., C, D and E grades), therefore, suggests that operational factors constrained performance. Among these are teacher competence and motivation, student-teacher ratio, and administrative support to the teacher. In Uttaranchal, most schools are poorly equipped, and understaffed. Moreover, students are promoted irrespective of performance upto the 10th grade. In many cases, class size is too large, i.e., more than 100 students, for effective teaching/learning. It must be kept in mind that the average pass percentage in government and government-aided high schools and intermediate colleges is in the region of 10 - 20 percent.

Some teachers by greater than average vision and hard work overcome these handicaps to a great extent. The course does require more work because of its practical and analytical nature. It also requires greater dedication than other subjects since the teacher is expected to involve the local community.

Assessment of learning outcomes in Teachers' Training courses

At the beginning of the 2000 - 2001 school year 213 in-service teachers were trained in 9 training courses for grades 6, 7 and 8. As usual these teachers came from Junior High Schools, High Schools and Intermediate Colleges, and possessed differing subject-matter backgrounds, both in arts and in sciences.

The teachers' training course focuses on the rationale of the course, particularly its socio-economic relevance, key concepts and teaching method for the EE course. Some of the practical exercises are carried out by the trainees in the manner prescribed by the workbooks.

To help teachers judge how well they understand the subject matter covered in the training, they are given a question paper on the last day of the course. These papers are collected and redistributed to the trainees. The answers are compared and discussed and then marked by the trainees. This

year the answers were carefully re-evaluated by USNPSS staff and the results tabulated and analysed. The main findings were the following.

The practical work involves mathematical operations using data the students collect themselves. These operations require a knowledge of the metric system, and the relationships of length, area, volume and weight, the calculation of averages and percentages. (These operations are covered in the concurrent mathematics syllabus for junior high school.) In grade 6 operations are single step, whereas in grades 7 and 8 most operations are multi-step. Table 5 gives the percentage of teachers correctly solving mathematical questions in the question paper. Teachers from high schools/intermediate colleges on an average scored 10 - 15 percentage units higher than those from junior high schools.

Table 5. The percentage of teachers correctly solving the mathematical questions in the question papers at the end of the teacher training courses

Grade	Percentage teachers correctly solving mathematical problems	
	Teachers with arts background	Teachers with science background
6	79	94
7	49	55
8	44	50
Overall	57	66

Many teachers had difficulty answering questions involving logical reasoning. They also had difficulty in describing many ecological concepts. Among these were: the phenomenon of spring flow, the relationship between forest cover and spring flow, the difference between top soil and depth of soil, slope angle, population dynamics and carrying capacity. It appears that we need to find ways of teaching these concepts more effectively. A complete

review of the teachers' training course, with a view to recasting it, is contemplated.

It must be pointed out that teachers' performance (written test as well as participation in class discussions) in the teachers' training course has not been found to be a very good indicator of subsequent teacher performance in teaching the course. A more decisive factor in determining a teachers' performance in teaching the course appears to be motivation. The next session describes our efforts to assess this.

Assessment of teachers' awareness and attitudes

When coming to a teachers' training course for the first time teachers generally have an image of EE as a 'soft' subject, that is, a subject that, in the final analysis, has little relevance to their own personal 'real' life concerns or of those of their students. They also assume that EE is not demanding academically. The purpose of school education, in their view, is to obtain a job outside the village, preferably in government service. They see no future for their students in the village. EE is about tree planting, protecting wildlife, and such distant, abstract problems as air pollution in cities and global warming. They are initially surprised, therefore, to learn that the course is about rural livelihoods and dismayed at its academic rigour. Helping them to appreciate the fact that there is no alternative to life in the village for a majority of students and that school education should provide them the knowledge and skills necessary to achieving at least a modest standard of living in the village, is therefore our first task. If teachers remain unconvinced, they are unlikely to be motivated to teach the course well.

By means of unstructured interviews and a questionnaire, we attempted to assess teachers' awareness of and attitudes towards local environmental problems and their bearing on village life and livelihoods. The interviews were conducted with and the questionnaire administered to teachers who came for training in the normal course during the 2000 -2001 school year. Two groups were selected: one of teachers who came for training for the first time (i.e., for

the initial orientation and 6th-grade training): the other was c teachers who had undergone two previous trainings (6th and 7th grades) and who came for the 8th-grade training. Interviews and the filling up of questionnaires was done before the current training courses began. The numbers of teachers involved are given in Table 6. A majority of the teachers interviewed had 10 years general teaching experience or more and came from a rural background. Nineteen were men and three were women. Interviewees were selected simply on the basis of their availability during the evening before the courses began. The questionnaire was administered to all the teachers attending the training, and some of them were also interviewed.

Table 6. Numbers of teacher trainees who were interviewed and who filled up the questionnaire

Group	Interview	Questionnaire
First-time trainees	16	17
Third-time trainees	6	17
Total	22	34

Three fourths of all the teachers interviewed saw the future of the village in a hopeful light. Trained teachers also gave a number of positive reasons for their view; they felt that the village community could be strengthened and that this would make it possible to rehabilitate the village support area, leading to increased water, fuelwood, fodder, milk and vegetables. Those without previous training could justify their view only on terms of limited job opportunities in cities and the high levels of urban pollution.

All teachers felt that poor roads, the absence of employment opportunities and poor health care and educational facilities were major problems in villages. The trained teachers, however, also mentioned environmental degradation fuelwood, fodder and water shortages — and explained why these problems have arisen.

When asked about the relationship between village forest cover and spring flow, none of the untrained teachers could explain it. One response as: “Only scientists can say.” Trained teachers, in contrast, generally recognised the positive effect of good tree cover on rainwater infiltration rate and the recharge of natural spring reservoirs.

Untrained teachers said that the way to increase crop yields was through irrigation, chemical fertilisers, new crop varieties and tractors, reflecting the standardised national textbook view. Trained teachers realised that in Uttaranchal this strategy does not work, and said that attention needs to be focused on improved village support-area management to increase fodder yields and hence compost production.

In general, what is to be done to improve life in the village in the future? untrained teachers said that government should set up industries, and provide raining in computers and sewing. None of the trained teachers mentioned .hose things; a majority spoke of the need for community effort to improve support area management. Some even said that expecting the government to provide for the future welfare of the village was quite wrong; they felt that village people themselves had to take the initiative.

The results of the questionnaire are briefly summarised in Table 7. These data indicate a significant change in outlook resulting from teachers' participation in the programme (teachers' training plus teaching the EE course in the school). Still, almost one-third of the third-time trainees displayed almost no awareness of the environmental and local livelihood dimensions of the current rural situation that the course seeks to foster. Or maybe they do not agree. This lack of awareness may be due to poor motivation and perhaps accounts for the poor performance of at least some of the teachers in conducting the course. The positive response of the two-thirds majority is, however, encouraging.

Table 7. Results of the questionnaire administered to teacher trainees.

Question	Percentage of teachers whose answers showed an awareness of the concepts covered in the course	
	First-time trainees	Third-time trainees
From a local point of view, what topics do you think should be included in EE?	12	59
What are the main problems in the villages around your school?	6	77
In the villages around your school, what is the effect of forest degradation on daily life?	35	94
What is the importance of trees?	6	65
In the villages around your school how can crop yields be increased?	18	77
"Village forests are thinning"; what is the reasons for this?	0	65
In the villages around your school why is springflow decreasing?	6	47
Living in the village, how can money incomes be increased?	6	77
To improve the standard of living of the residents of the villages around your school, which species of trees should be present in village forest? Why?	12	82
What do you consider to be the objective of school education?	41	76
Overall	14	72

Assessment of students' learning achievements, awareness and attitudes

An assessment of changes in students' awareness of and attitudes towards local environmental problems as a result of studying this course was undertaken in a random sample of 36 high schools and intermediate colleges throughout Uttaranchal. A questionnaire was administered to students of the 9th grade in these high schools and intermediate colleges during the 2000-2001 school year. These 36 high schools and intermediate colleges were a 20 percent sample of the 180 in which the EE course had been taught for three years or more. Of the total of 2615 students in this sample, 1500 (1078 boys and 422 girls) had studied the course, either in their present high school or intermediate college or in the junior high school which they attended earlier, and 1115 (802 boys and 313 girls) had not studied the course. The questionnaire contained 10 multiple-choice questions. For each question, one of the possible answers embodied an environmental concept featured in the course. The percentage of students in each of the two groups who selected these answers was tabulated, and the two figures compared.

In the final evaluation the sample of 36 high schools and intermediate colleges was divided into two groups, those with A and B grades (see Table 3 for definitions), 7 in number, and those with C and D grades, 29 in number. The results for the A- and B-grade high schools and intermediate colleges are given in Table 8. The differences in averages reveal a considerable difference in awareness/attitudes with respect to most questions. In the sample of C- and D-grade high schools and intermediate colleges these differences were less, though the trend of greater awareness was the same. Our conclusion is that when the course is being taught well it is resulting in marked positive change in awareness of and attitudes towards local environmental problems. In the matter of the relationship between the degree of village forest cover and water flow from springs/seepages (questions 3 and 8), students, like teachers (see Table 7), have trouble grasping this concept. Question number 6 was included to assess children's attitudes to traditional gender roles. The choices offered were: 1) girls; 2) boys; and 3) both girls and boys. The percentages of students

in the two groups selecting number 3, which was considered by us to be the appropriate answer, suggests that this issue of gender roles needs to be given more attention in the course in the future.

Table 8. Percentage of students who selected the answers indicating awareness/comprehension of the concepts taught in the course

Question	Students who had not studied the course	Students who had studied the course
1. What are the chief environmental problems in hill villages in Uttaranchal?	15	59
2. What is the reason for low crop yields in villages?	11	35
3. What is the reason for the drying up of water sources in villages?	14	31
4. In villages, what is the most worthwhile work for women?	15	54
5. How can living conditions in the village be improved?	20	72
6. Whose job should it be to fetch grass and fuelwood?	43	54
7. How will you increase milk production in your village?	20	73
8. Why do those water sources surrounded by broad-leaved forest produce more water?	15	26
9. In village forest, which species of tree is useful?	24	71
10. What is my purpose in going to school?	22	49